REMARKS

Support for the amendments to claims 1-3, 5, 6, 14, 15, 22, 25, and 26 is found in the as-filed application at at least paragraphs [0020], [0021], and [0030] and in as-filed claim 5.

The Office Action mailed December 20, 2006, has been received and reviewed. Claims 1-16 and 22-27 are currently pending in the application. Claims 1-16 and 22-27 stand rejected. Applicants have amended claims 1-3, 5, 6, 14, 15, 22, 25, and 26, canceled claim 4, and respectfully request reconsideration of the application as amended herein.

Panel Decision from Pre-Appeal Brief Review

As described in the Notice of Panel Decision from Pre-Appeal Brief Review, the previous rejection was withdrawn, prosecution was reopened, and a new Office Action would be mailed. The Examiner states that the outstanding Office Action includes a "different rejection over the same reference." Office Action of December 20, 2006, p. 2. However, Applicants respectfully submit that the outstanding rejection is substantially the same as the rejection maintained in the previous Office Action(s). Since the Panel decided that the previous rejection in light of U.S. Patent No. 6,232,265 to Bruening *et al.* ("Bruening") should be withdrawn, Applicants respectfully submit that it is improper for the Examiner to rely on Bruening to reject the pending claims.

35 U.S.C. § 103(a) Obviousness Rejections

Obviousness Rejection Based on Bruening

Claims 1-16 and 22-27 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Bruening. Claim 4 has been canceled, rendering moot the rejection as to this claim. Applicants respectfully traverse the rejection as to the remaining claims, as hereinafter set forth.

M.P.E.P. 706.02(j) sets forth the standard for an obviousness rejection:

> To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on

applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

The obviousness rejection of claims 1-3, 5-16, and 22-27 is improper because Bruening does not teach or suggest all of the limitations of the claims and does not provide a motivation to produce the claimed invention.

Bruening teaches a composition of a particulate solid support that includes a hydroxypyridinone-containing ligand that is covalently bonded to a solid support by a hydrophilic hydrocarbon spacer. Bruening at column 3, line 49 through column 4, line 14. The hydroxypyridinone-containing ligand includes three or more hydroxypyridinone ("HOPO") groups attached to a ligand carrier. *Id.* The solid support is an inorganic or polymeric organic material, such as silica, silica gel, silicates, zirconia, titania, alumina, nickel oxide, glass beads, phenolic resins, polystyrenes, or polyacrylates. *Id.* at column 5, lines 8-12. The solid support is attached to the hydrophilic hydrocarbon spacer by a covalent linkage mechanism. *Id.* at column 4, lines 8-14. The particulate solid support is used to selectively bind transition metal ions, post-transition metal ions, actinide metal ions, or lanthanide metal ions, from a source solution. *Id.* at column 6, lines 6-17.

Example 3 of Bruening teaches the preparation of tetrakis (5-amino-2-oxa-pentyl)methane as the ligand carrier. *Id.* at column 8, line 22 and column 9, lines 12-67. Tetrakis (5-amino-2-oxa-pentyl)methane (labeled 3C in Example 3) is synthesized from pentaerythritol and acrylonitrile using an Ag/KOH catalyst. *Id.* at column 9, lines 26-29. The mixture of pentaerythritol, acrylonitrile, and the Ag/KOH catalyst is stirred and added to water. *Id.* at column 9, lines 26-31. During the reaction to form a tetranitrile product (labeled 3B in Example 3), excess acrylonitrile is polymerized and removed by filtration. *Id.* at column 9, lines 32-35. The polymer is washed with chloroform, and the chloroform layer is washed with water and dried to provide the tetranitrile product. *Id.* at column 9, lines 34-37. The tetranitrile product is further reacted to produce the tetrakis (5-amino-2-oxa-pentyl)methane. *Id.* at column 9, lines 37-66.

Bruening does not teach or suggest the limitation of "dissolving at least one metal compound in a solvent to form a metal solution, the at least one metal compound comprising at least one metal selected from the group consisting of iron, zirconium, lanthanum, cerium, titanium, copper, antimony, and molybdenum," as recited in amended claim 1. Specifically,

Bruening does not teach or suggest the recited metals.

Bruening also does not teach or suggest the limitation of "dissolving polyacrylonitrile (PAN) into the metal solution to form a PAN-metal solution." While Bruening teaches that excess acrylonitrile in the mixture of pentaerythritol, acrylonitrile, and the Ag/KOH catalyst polymerizes, the polymerized acrylonitrile is a solid under the reaction conditions. Since this polymerized acrylonitrile is a solid, the polymerized acrylonitrile is not dissolved in a metal solution.

Bruening also does not teach or suggest the limitation of "depositing the PAN-metal solution into a quenching bath to form an adsorption medium comprising PAN and at least one metal hydroxide, the at least one metal hydroxide selected from the group consisting of iron hydroxide, zirconium hydroxide, lanthanum hydroxide, cerium hydroxide, titanium hydroxide, copper hydroxide, antimony hydroxide, and molybdenum hydroxide." Since Bruening does not teach or suggest the metals of the recited metal hydroxides, for the reasons discussed above, Bruening does not teach or suggest an adsorption medium comprising PAN and at least one metal hydroxide.

The cited reference also does not provide a motivation to produce the claimed invention. The Examiner acknowledges that Bruening does not teach or suggest "PAN in the adsorption medium" but states that "[i]t would have been obvious to one of ordinary skill in the art at the time the invention was made to use PAN because one of ordinary skill would expect at least some polymerized acrylonitrile and KOH to remain in the disclosed selective binding composition." Office Action of December 20, 2006, p. 3. However, even if polymerized acrylonitrile and KOH were present in the particulate solid support of Bruening (which Applicants do not concede), the above-mentioned method limitations are not taught or suggested for the reasons previously discussed. Furthermore, since the polymerized acrylonitrile is a solid under the reaction conditions, any polymerized acrylonitrile that is produced is removed by filtration before performing additional reactions that produce the particulate solid support of Bruening. As such, the particulate solid support of Bruening does not include polymerized acrylonitrile.

Claims 2, 3, and 5-16 are allowable, *inter alia*, as depending from an allowable base claim.

Claims 2 and 3 are further allowable because Bruening does not teach or suggest the

recited metals and, therefore, does not teach or suggest dissolving at least one metal salt, at least one metal oxide, or mixtures thereof in the solvent (claim 2) or dissolving at least one salt or at least one oxide of a divalent, a trivalent, or a tetravalent metal in the solvent (claim 3).

Claim 5 is further allowable because Bruening does not teach or suggest the recited metals.

Claim 6 is further allowable because Bruening does not teach or suggest dissolving at least one metal salt selected from the group consisting of a metal chloride, a metal oxychloride, a metal sulfate, a metal nitrate, and a metal acetate in the solvent. The Examiner relies on the teaching of using magnesium sulfate to dry a chloroform layer as teaching this limitation. However, since the magnesium sulfate is used to dry a chloroform layer, the magnesium sulfate is a solid and is not dissolved.

Claim 7 is further allowable because Bruening does not teach or suggest dissolving the at least one metal compound in nitric acid. Rather, the section of Bruening relied upon by the Examiner teaches using nitric acid as a receiving liquid that is flowed through a polyhydroxypyridinione ligand-solid support composition.

Claim 9 is further allowable because Bruening does not teach or suggest dissolving from approximately 3% by weight to approximately 5% by weight of PAN into the metal solution. The Examiner relies on the teachings of 0.8 mole acrylonitrile and 0.1 mole tetranitrile as teaching this limitation. However, neither acrylonitrile nor tetranitrile are PAN, as recited in claim 9.

Claim 10 is further allowable because Bruening does not teach or suggest spraying the PAN-metal solution into the quenching bath that includes an alkaline agent.

Claim 11 is further allowable because Bruening does not teach or suggest spraying the PAN-metal solution into the quenching bath that comprises from approximately 0.1M sodium hydroxide to approximately 8M sodium hydroxide.

Claim 12 is further allowable because Bruening does not teach or suggest simultaneously precipitating at least one metal hydroxide from the PAN-metal solution and insolubilizing the PAN in the PAN-metal solution.

Claim 13 is further allowable because Bruening does not teach or suggest producing a solid bead comprising at least one metal hydroxide incorporated into the PAN. Rather, the section of Bruening relied upon by the Examiner includes a hydroxypyridinone-containing ligand

that is covalently bonded to a solid support by a hydrophilic hydrocarbon spacer, where the spacer is a polymeric bead.

Claim 14 is further allowable because Bruening does not teach or suggest impregnating a support with the adsorption medium comprising PAN and the recited metal hydroxides.

Claim 15 is further allowable because Bruening does not teach or suggest impregnating a support with the at least one of the recited metal hydroxides incorporated into the PAN.

Claim 16 is further allowable because Bruening does not teach or suggest producing an adsorption medium having from approximately 10% by weight to approximately 85% by weight of a metal in the form of an elemental metal or the at least one metal hydroxide and from approximately 15% by weight to approximately 90% by weight of the PAN. While the section of Bruening relied upon by the Examiner teaches 40% Ag/KOH, Bruening does not teach or suggest that the adsorption medium comprises the recited amounts of the metal and PAN.

The Examiner appears to base the obviousness rejection on the fact that certain chemical compounds (*i.e.*, acrylonitrile, polymerized acrylonitrile, Ag/KOH, magnesium sulfate, acetic acid, nitric acid) are mentioned in Bruening. However, the Examiner overlooks the fact that claims 1-3 and 5-16 are method claims and recite method limitations, which are not taught or suggested by Bruening.

Bruening also does not teach or suggest all of the limitations of amended, independent claim 22. Specifically, Bruening does not teach or suggest the limitation of "a polyacrylonitrile (PAN) matrix and at least one metal hydroxide, . . ., the at least one metal hydroxide selected from the group consisting of iron hydroxide, zirconium hydroxide, lanthanum hydroxide, cerium hydroxide, titanium hydroxide, copper hydroxide, antimony hydroxide, and molybdenum hydroxide. Since Bruening does not teach or suggest the recited metals, for the reasons previously discussed, Bruening does not teach or suggest this limitation of claim 22.

There is also no motivation to produce the claimed invention for the reasons previously discussed.

Claims 23-24 are allowable, *inter alia*, as depending from an allowable base claim.

Bruening also does not teach or suggest all of the limitations of amended, independent claim 25. Specifically, Bruening does not teach or suggest the limitation of "dissolving polyacrylonitrile (PAN) in an organic solvent to form a PAN solution," for the reasons previously discussed. Bruening also does not teach or suggest the limitation of "adding at least one metal

oxide to the PAN solution to form a metal oxide-PAN solution, the at least one metal oxide selected from the group consisting of iron oxide, zirconium oxide, lanthanum oxide, cerium oxide, titanium oxide, copper oxide, antimony oxide, and molybdenum oxide" because Bruening does not teach or suggest adding at least one of the recited metal oxides to a solution that includes PAN.

Bruening also does not teach or suggest the limitation of "depositing the metal oxide-PAN solution into a quenching bath to form an adsorption medium comprising PAN and at least one metal hydroxide." Since Bruening does not teach or suggest the recited metal oxides or a solution that includes PAN, Bruening necessarily does not teach or suggest depositing such a metal oxide-PAN solution into a quenching bath or forming an adsorption medium comprising PAN and at least one of the recited metal hydroxides.

There is also no motivation to produce the claimed invention for the reasons previously discussed.

Claims 26 and 27 are allowable, *inter alia*, as depending from an allowable base claim.

ENTRY OF AMENDMENTS

The amendments to claims 1-3, 5, 6, 14, 15, 22, 25, and 26 should be entered by the Examiner because the amendments are supported by the as-filed specification and drawings and do not add new matter to the application.

CONCLUSION

Claims 1-3, 5-16, and 22-27 are believed to be in condition for allowance, and an early notice thereof is respectfully solicited. Should the Examiner determine that additional issues remain which might be resolved by a telephone conference, the Examiner is respectfully invited to contact Applicants' undersigned attorney.

Respectfully submitted,

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